

plant; those of the birches, especially of the silver birch and of the Burnham beeches, are instructive, but the best are the illustrations of two groups of Scotch firs at KinCraig that betoken group as well as individual habit. Many of the sprays, notably of the blossoming myrtle and hawthorn, and of the fruiting broom, are attractive, but it is not apparent that any useful purpose is served by these or the general collection, since it is not difficult and more advisable to obtain natural specimens in season. Miss Lorrain Smith has carried out satisfactorily the task of supplying appropriate brief notes, and doubtless appreciated the *Peziza* and *Usnea* that appear at the end.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

The Ooze of the Thames.

SOME time ago I directed attention to the part played by annelids in making the ooze of rivers, such as the Nile, fertile. Aided by a Government grant, research has been continued during the year, and in August a special visit was paid to Kew Gardens and the Thames. The river was very low, and I was able to collect specimens which are not always available, and bring away a sample of the ooze for careful examination. I found the mud teeming with *Helodrilus oculatus*, Hoffm., a new record for the south of England; *Paranais naidina*, Bretscher, new to Britain; *Monopylephorus elegans*, Friend, new to science; and other things, showing how much work still remains to be done by London naturalists. There were also many living nematodes, all apparently belonging to one species, half an inch or more in length. I have not yet been able to work out its history or discover its host, but the thing which seems to me to be of special interest relates to this parasitic creature. In examining the ooze from time to time the thing that struck one was the presence of numberless white threads of considerable length and great tenuity. These proved to be the integuments of vast numbers of dead nematodes. In the case of annelids, the process of decay is so rapid that dead worms are rarely found, and only by means of the most careful microscopic examination or chemical analysis can one discover how numerous they have been. But the evidence goes to show that the ooze of rivers is immensely enriched in nitrogenous matter year by year through the death of annelids, as well as oxygenated by their tireless movements.

While much has been done in the analysis of soils, little if anything seems to have been undertaken in relation to ooze. My own researches are at present largely restricted to the systematic study of the living species of annelids; but it would be of immense advantage to science, and especially to agriculture, if some expert like Dr. Russell could give us careful analyses of river oozes. I have appealed many times for samples of ooze from estuaries and rivers in order that something might be done, but hitherto the response has been very heartless, and there has been no alternative but to make special journeys to interesting localities, at great cost of time and money. The importance of the subject, however, is such that I venture again to bring it to the notice of students and investigators in the hope that it may receive the attention it deserves.

Swadlincote, September 16. HILDERIC FRIEND.

Ancient Forests in Scotland.

REFERRING to your correspondent's letters which appeared in NATURE of June 1 and August 24 last in regard to the contemplated cutting down of the fir trees at Auchnacarry, in south Inverness-shire, permit me to state that, though very old (say two to three hundred years), these cannot properly be said to have formed part of the ancient Caledonian Forest. The fir was very probably found in

the latter, and in certain places it may have been the prevailing description; unquestionably it is the most prominent survivor, and during the last few centuries has been one of the most important economical products of the Highlands of Scotland.

The cause of the disappearance of the Caledonian Forest has hitherto seemed obscure, if not inexplicable. Some light, however, is perhaps afforded by the fact that over the entire area which it covered, say all the counties north of the Firths of Forth and Clyde, except perhaps the Isle of Bute, Fife, Caithness, and the Orkney and Shetland Islands, the surface is frequently strewn with iron slags. So numerous are these latter in some districts that a hundred heaps of slag may be found almost within the confines of a single parish. From an examination of the pieces of charcoal found amongst these slags it has been ascertained that when these were formed the principal trees in the neighbourhood were birch and oak, but in some instances traces have been found of beech, ash, elm, fir, and holly.

Evidently in the more ancient times, namely, before the use of water-power was introduced in Scotland for the extraction of iron from the ore, two processes were successively employed for the purpose. In the earliest, the natural wind was taken advantage of, and the seat of operations was determined by the favourable physical configuration of the land to guide and concentrate the blast on the materials of combustion. From one document, at least, we learn that this method seems to have been employed down to 900 years ago. The sites associated with the later or succeeding process, and at which, presumably, bellows were used, are all in sheltered positions where the remaining forests were located; a few of the very last of these in operation can be dated as belonging to the fourteenth and fifteenth centuries. There is reason to believe that the bellows were in use in this connection as early as, if not earlier than, the Roman occupation.

When water-power for iron-making was introduced into Scotland at the beginning of the seventeenth century, the sites chosen were not only in protected situations also, but on low ground, on the banks of rivers, and preferably with suitable wood for fuel in the vicinity; but some of the latter seems to have been rolled down from the heights above, or floated by water from considerable distances. This class of works continued in operation generally until about 1760, and in the case of those near Inverary and Bunace until much more recent years. Charcoal made from pine wood was very largely used at all of this series of works.

From the foregoing it may be gathered that as the iron slag heaps of Scotland form the memorials of her ancient forests, our knowledge of the latter may be much restricted by a neglect of the study of the metallurgical industries there in former times.

GEORGE TURNER.

300 Langside Road, Glasgow, September 4.

"The Polynesian Wanderings."

YOUR review of my book, "The Polynesian Wanderings" (August 10), is warmly appreciated as performing the service of an introduction to scholars interested in the philology of the Pacific. In order to prevent a misconception of the work, I ask leave to note an exception to one or two statements in the review which might produce a wrong impression.

Mr. Ray comments upon the incommensurability of the several languages of Polynesia and Melanesia. What he puts in a few lines I had discussed in pages, and had announced that it was impracticable, in our present knowledge of Melanesian speech, to essay a quantitative comparison. On pp. 142 and 143 of the volume I have been at pains to establish my method of comparison by computing a coefficient of recognisability of the Proto-Samoan borrowed element in some ninety Melanesian languages. This is a figure which may be reached independently of the quantity of the loan material; it rests upon each borrowed word by itself in comparison with the same word as found in the present speech of Nuclear Polynesia; it expresses the extent of the deviation from the norm. The determination of quantity lying beyond our reach at present, I have utilised the only element of comparison which in years of research I have been able to discover,

that of quality. When Mr. Ray has read again my detailed statement of method he will be the first to thank me for having introduced some principle of comparison where none has hitherto existed. I am convinced that this coefficient of quality amounts to more than a makeshift; its value will exist in its applicability as a constant factor. Mr. Ray cites my determination of coefficient 93 for Ngunu and 76 for Sesake, "the same language, Sesake being a colony from Ngunu." The lower coefficient of Sesake is not a matter of mere opinion; it is the mathematical product of the presence in that language of several consonant mutations expressive of a wider diversification from the Proto-Samoan stem. If we were in possession of practically complete dictionaries of Ngunu and Sesake, this coefficient of quality would, in my best judgment, still be applicable. Suppose that such dictionaries should exhibit Ngunu as having Proto-Samoan loan material quantitatively to the extent of 100 words to the thousand, and Sesake 125; of course, it is understood that I am using figures symbolically. We should err in assigning to Ngunu a 10 per cent. Proto-Samoan element and to Sesake 12½ per cent. We should have to regard quality as well as quantity; we should have to employ my quality coefficient (subject to such recomputation as a better supply of data would make possible) as an essential factor. Thus Ngunu, as a result of the combination of the two elements, would be indicated by 9·3 per cent, and Sesake by 9·5 per cent. Then and thus only will it be possible to state positively that Ngunu and Sesake have received the same influence from the Proto-Samoan, the question of whether *qua* Melanesian they are the same language being a matter wholly distinct.

It was of set purpose that I have omitted the discussion of the syntax of the grammar of Oceanic languages. Our present material is all stated most inaccurately; our authorities, without exception, have stated their considerations of grammar in terms of the grammatical categories of inflected speech. The grammar of these isolating languages must be newly written. It will form a large part of the Samoan dictionary of Polynesian philology upon which I am now engaged. In various publications I have made preliminary announcement of some of the principles of this grammar—e.g. in my monograph on the Beach-la-mar jargon, just published, I have dealt with the evolution of the verb in the diffuse attributive; but in the present incomplete stage of the study it did not seem advisable in the volume under review to seek to exceed the phonetic examination of the material there assembled.

WILLIAM CHURCHILL.

New York, August 28.

In my review of Mr. Churchill's book, "The Polynesian Wanderings," I certainly intended my remark as to the liability of error arising from deficient and imperfect material to apply both to quantitative and qualitative comparisons. With regard to the former, there can be no dispute, and the impracticability of quantitative comparison was recognised by Mr. Churchill on p. 143 of his book. But a qualitative comparison as given by Mr. Churchill in his tables, and referred to in the letter, seems to be equally liable to error through inaccuracy in the material. Referring again to the tables for Ngunu and Sesake, which I took as typical cases, Mr. Churchill finds that the lower coefficient of Sesake—i.e. 76 as opposed to Ngunu 93 (implying that Sesake was less like Polynesian than Ngunu)—was due to the presence in Sesake "of several consonant mutations expressive of a wider diversification from the Proto-Samoan stem." Mr. Churchill's Sesake words were taken from the lists of Codrington and Gabelentz. The source of his much shorter list in Ngunu is not stated. Using a longer list by Bp. Patteson (from which those of Codrington and Gabelentz were derived) and a very long (MS.) vocabulary of Ngunu, I find that all Mr. Churchill's examples in Sesake are identical with Ngunu, and all the Ngunu are identical with Sesake. The consonant mutations are the same. Thus the quality of the likeness to Polynesian is the same for both languages, and the great difference in Mr. Churchill's results is entirely due to the lists being defective and appearing under different names. For the accurate

application of Mr. Churchill's comparisons the vocabularies used *must* be equal in extent and signification.

My desire in the note on Mr. Churchill's omission to discuss grammar was to direct attention to the fact that he had not shown that any distinctively Polynesian particles (as, e.g., the article *te*, the verbal signs *kua*, *na*, the so-called possessive words *luku*, *toku*, &c.) were used in Melanesian languages.

SIDNEY H. RAY.

Habits of Dogs.

I HAVE read with interest the letter of Miss Everett in your issue of August 31 on dogs eating wasps, as I have a poodle which also eats them, with evident satisfaction. He generally catches them alive, but will also pick them up from the floor when recently killed; he evidently suffers somewhat from the sting, but only for ten or fifteen seconds.

I have always attributed this liking for wasps to some stimulating action of the poison similar to that produced by formic acid on man; this idea was suggested by the following plan, learned in Switzerland.

If a freshly peeled wand be plunged into an ants' nest, so as to be bitten by the infuriated ants, and is then passed between the lips, a sensation of refreshment is experienced which appears to be out of proportion to the effect which one would expect from the mere acidity.

I believe that I have read somewhere that formic acid is a stimulant.

ROBERT VENABLES.

8 rue du Sundgau, Mulhouse, Alsace, September 8.

ON p. 348 Dr. Kidd asks if it is known to be a common thing for dogs to carry hedgehogs in their mouths. I can only answer for my own dog, a fox-terrier. Last season a hedgehog strayed into our garden, and appeared anxious to stay; but the dog carried it in his mouth repeatedly, and so teased it in various ways, that we were not surprised when the hedgehog beat a permanent retreat by absconding. The curious circumstance in the affair was that the dog appeared to carry the hedgehog, rolled in a ball, without causing his lips to bleed; in this particular, Carlo seems to be cleverer than Dr. Kidd's dog!

Braewyn, Earlsfield Road, Wandsworth Common.

R. HOOPER PEARSON.

A Gilbert White Manuscript.

MENTION has been made in the Press of the recent sale of a hitherto unpublished manuscript by Gilbert White. It consists of a nature calendar which the author of "The Natural History of Selborne" carefully drew up before he wrote the first of the letters which are the basis of his famous book. To the latter, he tells us, he meant to add an "Annus Historico-Naturalis," and it seems that the MS. in question was intended to be used in this connection. I am pleased to say that the Selborne Society will shortly produce the calendar (which is particularly interesting) in facsimile, and print a limited edition on Italian hand-made paper.

I should be glad to give further particulars to any of the many admirers of Gilbert White who would care to have them.

WILFRED MARK WEBB.
(Honorary Secretary.)

The Selborne Society, 42 Bloomsbury Square,
London, W.C., September 19.

Miniature Rainbows.

THE recent letters on miniature rainbows recalled to my mind a rather interesting case which I observed some years ago at Inversnaid, on Loch Lomond. Here a small stream makes a pretty waterfall; and while standing beside the pool at the base of the fall, and directly opposite the fall itself, I noticed first a brilliant rainbow reflected in the pool. The actual bow was formed in the spray above the pool, and, unless my recollection is greatly at fault, it appeared less brilliant than its reflection. But the bow and its reflected image, viewed together across the pool, formed an almost complete circle, broken only where the extremities of the real bow in the spray appeared to come down towards the surface of the pool.

A. L. LEACH.

Giltar, Shrewsbury Lane, Shooters Hill,
September 16.